

South Dakota Quality Assurance Project Plan for Statewide Lake Assessment



South Dakota

Department of Agriculture and Natural Resources

Division of Resource Conservation and Forestry

Watershed Protection Program

April 2022

A1: Signature Page

STATEWIDE LAKES ASSESSMENT QUALITY ASSURANCE PROJECT PLAN

SUBMITTED BY:

SOUTH DAKOTA DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES

DIVISION OF RESOURCE CONSERVATION AND FORESTRY

WATERSHED PROTECTION PROGRAM

APPROVED BY:



South Dakota Watershed Protection Program
Administrator

5-24-2022
Date



South Dakota Watershed Protection Program
Environmental Scientist Manager, Assessment Team

5-24-2022
Date



South Dakota Watershed Protection Program
Environmental Scientist Manager, Implementation Team

5-24-2022
Date



South Dakota Watershed Protection Program
Quality Assurance Officer

5-24-22
Date



South Dakota DANR Quality Assurance Officer
Quality Assurance Officer

5-27-22
Date



South Dakota Watershed Protection Program
SWLA Project Officer

5/23/2022
Date

A2: Table of Contents

A1: Signature Page	i
A2: Table of Contents	ii
List of Tables	iii
A3: Distribution List	1
A4: Project Organization	1
Roles and Responsibility	1
Management Responsibilities	1
A5: Problem Definition/Background	2
A6: Project Description and Schedule	3
A7: Data Quality Objectives and Criteria	7
A8: Special Training and Certification	8
A9: Documents and Records	8
B1: Data Generation and Acquisition	9
B2: Sampling Methods	10
B3: Sample Handling, Custody and Documentation	12
B4: Analytical Methods	13
B5: Quality Control	13
B6: Instrument/Equipment Testing, Inspection, and Maintenance	14
B7: Instrument/Equipment Calibration and Frequency	15
B8: Inspection/Acceptance of Supplies and Consumables	15
B9: Non-direct Measurements	15
B10: Data Management	15
C1: Assessment and Response Actions	16
C2: Reports to Management	16
D1: Data Review, Verification and Validation	16
D2: Verification and Validation Methods	17
D3: Reconciliation with User Requirements	17
Appendix A: Lakes and Associated Stations for 2022 SWLA	18
Appendix B: South Dakota DANR Water Quality Datasheet	19
Appendix C: Chain of Custody Form for SWLA	20

List of Tables

Table 1. SD DANR staff distribution list.....	1
Table 2. Water quality parameters collected for SWLA.....	4
Table 3. Table of sample types, parameters, and shipping method.	5
Table 4. Timeline for SWLA work activities.....	7
Table 5. Sample bottle types for SWLA.....	11
Table 6. Holding times and preservation methods for SWLA samples.	14

A3: Distribution List

The current version of the Quality Assurance Project Plan (QAPP) will be posted on the DANR website and on the Statewide Lake Assessment (SWLA) webpage. It will also be saved under the file pathway; N:/WATRSHED/QAQC – SOP/QAPP.

Table 1. SD DANR staff distribution list.

Name	Title
Bill Smith	Division Director
Barry McLaury	Administrator Watershed Protection Program, Manager II
Paul Lorenzen	Team Leader/Environmental Scientist Manager I Assessment Team
Kris Dozark	Team Leader/Environmental Scientist Manager I Implementation Team

All personnel involved with assessment and implementation sampling activities for the South Dakota Department of Agriculture and Natural Resources, Watershed Protection Program (SD DANR WPP) shall receive a copy of this plan and therefore should be thoroughly familiar with WPP sampling policies, management structure, and procedures. Compliance with QAPP elements results in data collection and management that is valid and suitable for use in implementation, water quality and (TMDL) Total Maximum Daily Load assessments projects, other programs, and projects.

A4: Project Organization

The following individuals are responsible for the design and implementation of this project:

Roles and Responsibility

The SWLA Program Manager will be responsible for scheduling and coordinating lake monitoring efforts. Jesse Wilkens will serve as the primary contact for SWLA. Jesse will coordinate with the South Dakota State Public Health Laboratory (SD Health Lab), Mid Continent Testing Laboratories (Mid Continent), Aquatic Analysts Inc. and DANR WPP staff to facilitate collection and analysis of samples. All samples will be collected by DANR WPP staff. The SWLA manager will coordinate with WPP staff regarding sample results and any recommended follow-up actions that may need to be taken.

Management Responsibilities

Quality Assurance (QA) Responsibilities:

The DANR QA Office, Tyler Frideres, will be responsible for interpreting the validity of the data. SD Health Lab analysts, Mid Continent analysts and Aquatic Analysts phycologists will be responsible for conducting the laboratory analyses according to their approved Standard Operating Procedures (SOPs) and ensuring that all field documentation submitted with samples has been satisfactorily completed. Jesse Wilkens, SWLA coordinator, will coordinate with WPP staff and laboratory partners to ensure that all samples are collected according to the standard operating procedures described in the Standard Operating Procedures for Statewide Lake Assessment, Version 1 April 2022.

Field Responsibilities:

All samples will be collected by DANR WPP staff and will follow all QAPP guidance and SOP methods.

Laboratory Responsibilities:

The South Dakota State Public Health Lab (Pierre), Mid Continent (Rapid City), and Aquatic Analysts Algae Analytical Services (Friday Harbor, WA) will be responsible for laboratory analysis. The SD Health Lab will provide conventional chemical sample analysis for all samples collected by WPP staff in the Pierre, Vermillion, and Sioux Falls offices. Mid Continent will provide conventional chemical sample analysis for all samples collected by WPP staff in the Rapid City office. Algae identification/enumeration samples will be analyzed by Aquatic Analysts Algae Analytical Services.

Laboratory and Field Audit Responsibilities:

Laboratory audits will occur as specified in the SD Health Lab QAPP/SOP, the Mid Continent QAPP/SOP and the Aquatic Analysts Algae Analytical Services QAPP. All field sampling will be conducted by DANR staff. Field audits will be conducted by the QA/QC officer or the SWLA Program Manager on an as-needed basis.

Jesse Wilkens, SWLA Program Manager, will make sure that the QAPP is followed as approved; and that all DANR WPP staff working on SWLA have access to the most current version of the QAPP and SOP and all necessary documents to sample for SWLA. Personnel will be informed of all requirements for the project prior to any sampling.

A5: Problem Definition/Background

The lakes of South Dakota provide a basic natural resource, recreational in nature, of utmost importance to the economy of the state and quality of life for its residents. Approximately 800 lakes, ranging in size from prairie potholes to the Missouri River mainstem reservoirs, are readily available for public use. 573 state lakes have been recognized as significant waterbodies, specifically categorized by the South Dakota Department of Agriculture and Natural Resources (SDDANR) as to their assigned beneficial uses. Of these lakes, 174 have been identified as being of sufficient importance to warrant routine monitoring.

Data is necessary for assessing the condition of South Dakota lakes and tracking long term trends. SWLA is the primary state program in South Dakota for lake water quality monitoring. Data produced by SWLA is used for various state-level purposes and provides data useful to researchers and other government agencies.

Goals and Objectives:

The goals of the Statewide Lake Assessment are:

- Determine if lakes are meeting their water quality standards and supporting their beneficial uses.
- Identify lakes for protection and restoration under the South Dakota 319 program.
- Identify long-term trends in lake water quality and habitat condition.

Every year, a portion of the lakes in South Dakota are selected for monitoring based on a series of priorities, which are listed below.

Integrated Report Assessment: Lakes with a nonsupport status that require updated data to determine status (EPA categories 4a and 5). Lakes that lack water quality data to make an appropriate assessment determination (EPA categories 2 and 3), where desired.

TMDL Development: Lakes on the 303(d) Vision TMDL Priority Schedule. These are lakes scheduled for TMDL development and, as such, require sufficient data to calculate loadings and load reductions.

Publicly Important: Lakes are divided into three tiers based on best professional judgment of economic value, recreation use, and public interest.

Tier 1 - Lakes with the highest economic value, recreation use, and public interest. This tier is comprised of 44 lakes, of which approximately 18 will be visited 3 times each during a typical year. Each Tier 1 lake will be sampled four years out of every 10 years.

Tier 2 - Lakes with significant economic value, recreation use, and public interest. This tier is comprised of 86 lakes, of which approximately 17 will be visited 3 times each during a typical year. Each Tier 2 lake will be sampled two years out of every 10 years.

Tier 3 - Lakes with the least amount of economic value, recreation use, and public interest. This tier is comprised of 44 lakes. Tier 3 lakes will not be sampled as part of the Publicly Important priority. Sampling will occur only when data is required for the other priorities of the Statewide Lakes Assessment program, such as TMDL development and Integrated Report Assessment.

Priorities are not ranked in order of importance to allow flexibility on an annual basis to meet the needs of each specific priority and to integrate with other projects that engage in lake monitoring to prevent duplication of efforts. If the lakes monitored for the Integrated Report Assessment and TMDL Development priorities are in Tier 1 or Tier 2 of the Publicly Important priority, it will have little impact on the frequency that each lake is sampled over the course of a 10 year period. However, if Tier 3 lakes are sampled for the Integrated Report Assessment and TMDL Development priorities, some Tier 1 and Tier 2 lakes may be sampled less frequently.

A6: Project Description and Schedule

SWLA is a state program designed to produce high quality data from South Dakota lakes for use by DANR and other agencies. In 2022 a total of 35 lakes will be monitored. These lakes are listed in Appendix A. Variances in the total number of lakes monitored may occur if concurrent WPP projects do not allow sufficient staff time for 35 lakes to be monitored.

Upon each lake visit, water is collected at three mid-lake stations located throughout the lake basin(s) and composited into a single container for analysis of conventional chemical laboratory parameters and algae ID/enumeration samples. Laboratory parameters that will be analyzed are listed in Table 1. Results from these composite stations are tagged with a single station identification code, the primary lake station, and are intended to be representative of the entire lake. Primary lake stations for all 174 lakes identified for monitoring are presented in Appendix A.

Table 2. Water quality parameters collected for SWLA.

Alkalinity	Total Suspended Solids
Nitrate/nitrite	Chlorophyll-a
Total Phosphorus	Total Chlorides
Total Kjeldahl Nitrogen	E. coli
Total Ammonia as N	Algae ID/Enumeration
Total Dissolved Solids	

Vertical profile measurements for dissolved oxygen, specific conductance, water temperature and pH are also collected at the three mid-lake stations. The three mid-lake stations are designated by the main lake station ID with either A, B or C added to the end of the station ID. A measurement is logged 0.5 meters below the water surface, then measurements are logged at every whole meter depth until reaching the bottom, where a final measurement is logged 0.5 meters above the substrate. These measurements are collected using a YSI EXO multimeter. Multimeters are calibrated each day according to the SWLA Standard Operating Procedures. Data from vertical profile measurements is uploaded into the DANR NR92 water quality database. A total of 3 vertical profiles will be measured during each lake visit, resulting in 315 vertical profile measurements for the field season.

E. coli samples are collected at the bacteria station for each lake. Some lakes have multiple bacteria stations but only one is sampled per visit depending on which lake access point is used by field staff. Bacteria stations are located primarily at swimming beaches, but if a beach is not present the bacteria station will be located at a public access point, usually a boat ramp.

Routine lake sampling for SWLA will occur from June to August, with flexibility to continue sampling into early September if necessary. This timeframe focuses on the growing season when lakes are most productive. It also provides an index period within which sample results may be most comparable.

Lakes will be visited for sampling three times per year. Ideally these three visits would occur in June, July, and August, but some variance may be necessary due to weather conditions and scheduling conflicts.

Table 3. Table of sample types, parameters, and shipping method.

Sample Type	Sampling Time Frame	Analytical Parameters	Shipment	Results
Composite	Monthly; June, July, August	Alkalinity, Nitrate/nitrite, Total Phosphorus, Total Kjehldahl Nitrogen, Total Ammonia as N, Total Dissolved Solids, Total Suspended Solids, Chlorophyll-a, Total Chlorides, Algae ID/Enumeration	Ship on day of sample collection. Samples must arrive at laboratory within 48 hours.	Approximately 2 weeks, except Algae ID/enumeration which will be analyzed after the conclusion of the sampling season.
Bacteria	Monthly; June, July, August	E. coli	Ship on day of sample. Samples must arrive at laboratory within 24 hours.	Approximately 2 weeks.
Multimeter Vertical Profile Measurements	Monthly; June, July, August	Dissolved Oxygen, pH, Specific Conductance, Water Temperature	Data will be provided to SWLA Manager monthly.	Will be uploaded to NR92 database after field season.

Sample shipping by Pierre, Vermillion, and Sioux Falls field staff will utilize the Same Day Express courier service that transports samples to the SD Health Lab daily. Samples will be shipped on the day of collection to meet analyte holding times, particularly for E. coli which has a 24-hour holding time. Pick up locations and times can be arranged the morning of sampling by calling Same Day Express. Chlorophyll and algae ID/enumeration samples will be shipped to the SD Health Lab and will be retrieved by DANR staff on the day of arrival.

Samples collected by Rapid City field staff will be dropped off in person at Mid Continent in Rapid City on the day of collection or immediately the following morning. Chlorophyll samples will be filtered and stored in a freezer at the Rapid City DANR field office until transport to the Pierre DANR office. Algae ID/enumeration samples will be held at the Rapid City DANR field office until the end of the field season.

Same Day Express

605-366-3299

South Dakota State Public Health Laboratory

Dr. Tim Southern, Laboratory Director

Stacy Ellwanger, Environmental Health Supervisor

615 East 4th St.

Pierre, SD 57501-1700

Phone — 605-773-3368 or 1-800-738-2301

Fax — 605-773-6129

Mid Continent Testing

P.O. Box 3388

2381 South Plaza Drive

Rapid City, SD 57709

Phone: 605-348-0111

Fax: 605-721-0265

Aquatic Analysts

Jim Sweet

43 Telegraph Ln

Friday Harbor, WA 98250

(503) 869-5032

jwsweet@aol.com

www.AAalgae.com

Changes to the sampling approach identified in this QAPP will be documented as necessary. The schedule for the 2022 SWLA field season is shown below in Table 4. Please note that this table is an estimated timeline of events for the year.

Table 4. Timeline for SWLA work activities.

TASK	2022											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
QAPP development	X	X	X									
QAPP Approval				X								
Sampling (DANR)						X	X	X				
Lab analysis (SD Health Lab, Mid Continent)						X	X	X	X			
Lab Analysis (Aquatic Analysts)											X	X
Project Data Analysis										X	X	X

A7: Data Quality Objectives and Criteria

The primary data driven objectives for the SWLA program are to provide data for 303(d) assessment and TMDL development. Results from the sampling will be used by the State of South Dakota to make 303(d) listing assessments for lakes and to develop Total Maximum Daily Load documents. Further objectives of the SWLA include observing long term trends in South Dakota’s Lake water quality and identifying public health concerns for lake recreators.

DANR will follow the criteria for deciding if data quality objectives have been met in terms of Completeness, Representativeness, Comparability, Precision, and Accuracy.

Completeness is a measure of the amount of valid data obtained from measurement systems compared to the amount that expected to be obtained under optimum conditions. For a set of data to be utilized with confidence to assess a parameter for a waterbody, the data must be complete, ie., there must be enough valid data from analysis to facilitate making the assessment. The SWLA dataset will be considered complete as long as 90% of planned samples are collected and analyzed.

Representativeness expresses the degree to which data accurately and precisely represents the characteristics of that which is being measured. All samples will be collected in such a manner and at such sites to be representative of the medium from which they are taken. Multiple stations within each

lake will be sampled in order to get a representation of the entire lake and to account for wind and other currents. Lakes that are sufficiently small in surface area that environmental factors result in chemically homogenous waterbody, samples will be collected at a single central station.

E. coli samples will be collected at the lake's shoreline location where the greatest proportion of recreational activity takes place. The primary location for *E. coli* collection are public swimming beaches. Secondary locations for *E. coli* sample collection are public access areas such as boat ramps.

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be measured and assessed using standard, published sampling and analytical data. The comparability of data is achieved by the commitment of SD DANR staff and contracted laboratories to use standardized methods, where possible, including the SD DANR SWLA Standard Operating Procedures, EPA-approved analytical methods, standard methods, or documented modifications thereof which provide equal or better results. All analytical results will be reported in appropriate concentration values and units to facilitate comparison.

Precision is a measure of the reproducibility of the measurement when an analysis is repeated. It is reported in Relative Percent Difference (RPD) or Relative Standard Deviation (RSD). Precision will be assessed through field duplicate and lab duplicate analyses. Collection of field blanks will also make sure there is no cross contamination.

Accuracy is a measure of how much of the constituent is present. It shows how close the sample value is to the "true" value. Accuracy will be assessed through the project by the collection of field blanks and duplicates. Also, following QA/QC practices will help ensure that accuracy is accounted for.

Please refer to the SD DANR SWLA SOP Volume 1 for measurements of precision and accuracy and specific procedures for corrective actions.

A8: Special Training and Certification

Any special training requirements needed for the completion of this project will be assigned on an as-needed basis. Jesse Wilkens, the project officer, will make sure that any necessary and needed training is documented and completed. All training and certifications will be discussed with the Quality Assurance Officer, Tyler Frideres.

A9: Documents and Records

Documentation and record collection is an integral part of maintaining proper QA protocols. The project officer, Jesse Wilkens, will make sure that before any sampling is done, that all staff have a copy of the most current version of the SWLA SOP and QAPP. Prior to project sampling, Jesse will also make sure that all sampling sites have been entered into the NR92/WISKI database with the correct information and latitude and longitude. All data will be stored indefinitely on a SQL server and backed up to the state IT system. Information about sample analysis and location will be shared with the public.

At the completion of the project, all project data, reports, documentation and records will be given to the project officer and stored.

B1: Data Generation and Acquisition

Sampling Design (Experimental Design):

The general purpose of the program, providing lake data for 303(d) assessment and TMDL development, is reflected in the sampling design. A total of 175 lakes are considered for monitoring each year. Because resources limit the number of lakes that can be monitored on an annual basis, a tiered system is used to prioritize lakes for monitoring. Lakes with the most recreational and economic value are placed in Tier 1 and are monitored, on average, 4 out of 10 years. Lakes with substantial recreational and economic value, but less value than Tier 1, are placed into Tier 2 and are sampled 2 out of every 10 years, on average. Lakes with the least recreational and economic value are placed in Tier 3 and are only sampled when data is required for TMDL development or 303(d) assessment.

A total of 35 lakes will be monitored annually. Each lake will be visited three times during the growing season for a total of 105 sample sets. These lakes are selected based on best professional judgment of the SWLA coordinator. Considerations that go into selecting lakes for the year include:

- Maintaining the routine monitoring schedule to ensure Tier 1 lakes are sampled 4 out of every 10 years and Tier 2 lakes are sampled 2 out of every 10 years.
- The efficiency with which lakes may be visited, such as selecting lakes in close geographic proximity to reduce staff travel time.
- Whether there is an imminent need for data from a particular lake(s).

South Dakota DANR staff will be collecting multiple types of samples and measurements from each lake. Table 3 lists each parameter collected or measured for each data collection activity. Composite samples will be collected to a depth twice the euphotic zone from three locations spaced throughout a lake basin. These stations are stored in the NR92 water quality database. Vertical profiles will be measured with a multimeter at the same three locations where water is collected for the composite sample. A total of 315 vertical profiles will be collected. Vertical profiles will provide data representative of the lake's entire water column, characterizing the epilimnion, metalimnion and hypolimnion. Grab samples will be collected for E. coli at public access locations where recreation is most likely to occur. E. coli and composite samples will be shipped, or hand delivered on wet ice to the appropriate laboratory listed on page 7.

Sampling Schedule:

Lakes will be sampled monthly from June to August. Sampling may proceed into early September if weather conditions and/or other factors impede the full slate of lakes to be scheduled at the scheduled time. This time frame focuses on the growing season, when lakes are most likely to be at full algal and macrophyte productivity. The sampling schedule also coincides with the recreation season in South Dakota. Most water recreation that involves immersion occurs during these months. Collection of E. coli and chlorophyll-a samples concurrent to maximum water recreation provides the public with the most applicable information regarding the safety of water recreation activities.

Sample Collection Stations:

Sampling locations and descriptions have been assigned by the State of South Dakota and can be found in Appendix A. Sample station locations are recorded in the NR92 database and can be viewed online on the Water Quality Monitoring Access Portal <https://apps.sd.gov/NR92WQMAP>. Sample station locations will also be provided to DANR WPP staff via Google Maps and/or the Avenza application.

Stations where water is collected for the composite sample and vertical multi-meter profile measurements are performed end with an A, B or C, for example SWLAZZZ9502A. Stations where E. coli samples are collected have BAC in the middle of the Station ID code, for example SWLABAC9502.

B2: Sampling Methods

Sampling Methods:

Samples are collected by DANR WPP staff according to protocols defined in the SD DANR Statewide Lake Assessment Standard Operating Procedures document.

Water for the composite sample will be collected to a depth twice the Secchi disk measurement at each of the three composite stations on each lake, then deposited into the composite jug for mixing. The composite jug should be rinsed with DI water on shore before embarking onto the lake for sampling. The water will be collected using an integrated sampler tube constructed of PVC. After water has been collected at all three stations and deposited into the composite jug, sample bottles A, B, chlorophyll-a and algae ID/enumeration will be filled directly from the composite jug. Bottles will be rinsed and preserved according to information in Table 2.









The E. coli sample (C bottle) will be collected at the designated bacteria station, which is located along the shoreline at either a public swimming beach, boat ramp, or other public access point. The collection method is a grab sample, where their sampler wades into the water and collects the sample at a depth of approximately 0.3m.

Vertical multimeter profiles will be collected using a multimeter probe that will be calibrated each day before use. The pH calibration will consist of a 2-point calibration at pH 7 and pH 10. The multimeter data filter will be set to the most rapid averaging period possible to minimize time needed for sensors to stabilize between measurements. A surface measurement will be logged at a depth of 0.5m and subsequent measurements will be logged at whole meter intervals starting at 1m. At least 20 seconds must pass between measurements to allow sensors to stabilize. A bottom measurement will be logged 0.5 meters above the substrate. It is important to not drop the multimeter sonde into the substrate with force, which suspends sediment and influences results.

Sample Bottles:

A total of 5 bottles will be filled at each lake. Four bottles will be filled from the composite jug. These include the A bottle for inorganic compounds (1 L bottle), the B bottle for nutrients (1 L), the chlorophyll-a bottle (opaque brown HDPE bottle 500-2000mL) and the algae ID/enumeration bottle (125mL HDPE pre-preserved with Lugol's solution). The C bottle for E. coli (250mL) will be filled at the bacteria collection station.

Table 5. Sample bottle types for SWLA.

Image	Bottle	Size	Lab	Preservation	Rinse
	A	500mL	Mid Continent Rapid City, SD	Ice	Yes
	B	500mL	Mid Continent Rapid City, SD	1mL sulfuric acid, Ice	Yes, if not pre-preserved
	C	125mL	Mid Continent Rapid City, SD	Sodium Thiosulfate, Ice	No
	A	1-Liter Narrow Mouth Nalgene	Health Lab Pierre, SD	Ice	Yes
	B	1-Liter Narrow Mouth Nalgene	Health Lab Pierre, SD	2mL sulfuric acid, Ice	Yes
	C	250mL	Health Lab Pierre, SD	Ice	No
	Chl-a	500ml, 1-liter, or 2-liter (always brown)	DANR Lab Pierre, SD	Ice	Yes
	Algae ID/enumeration	125mL	Aquatic Analysts	Lugol's	No

Site Disturbance:

Ensure that the sample site is not disturbed prior to collecting a sample. Disturbing the sediment can resuspend E. coli and result in uncharacteristically high turbidity and E. coli concentrations that wouldn't have been there if the site wasn't disturbed.

- Avoid walking in the water near the edge of the waterbody.
- Don't enter the waterbody prior to sample collection.

Sampling Equipment Cleaning:

The composite jug will be rinsed on shore with deionized water three times before field staff start sampling. The integrated sampler tube will be rinsed with lake water at each site before sample collection.

Field Duplicates:

A field duplicate is collected in the same manner as a regular sample. The duplicates are given their own sample number and labeled as “duplicate” for the sample type. A duplicate sample set consists of all bottle types scheduled for collection from each lake. The field duplicate sample is factored into the total number of samples. A field duplicate will be collected for every 10 samples.

Blank:

A field blank is treated in the same manner as a regular sample. The blanks are given their own sample number and labeled as “blank.” A blank sample set consists of all bottle types scheduled for collection from each lake. The field blank sample is factored into the total number of samples (e.g., one sample plus one duplicate and one field blank for a total of three samples). Field blanks should be filled with deionized water. A blank will be collected for every 10 samples.

Corrective Actions:

Corrective actions for deficiencies will be addressed immediately in the field or after lab receipt (documentation errors). Corrective actions include but are not limited to; discarding improperly collected or handled samples, re-sampling, and correcting labels or COC’s. The SWLA coordinator will work and communicate with the DANR staff and QA/QC officials in order to fix and issues or deficiencies with sample collection and documentation.

B3: Sample Handling, Custody and Documentation

All samples except algae ID/enumeration samples will be stored on ice or refrigerated (4-8°C) in the dark. If samples are being shipped the day of sample collection, they will be kept in the dark on ice until shipment. If samples are being held overnight, samples will be placed in a refrigerator until ready for shipment or delivery. Samples collected by Pierre, Sioux Falls and Vermillion staff will be shipped to the SD Health Lab by using the SD Health Lab courier, Same Day Express. Samples collected by Rapid City staff will be hand delivered to Mid Continent. E. coli samples must be received by the lab within 24 hours of collection. The SD Health Lab and Mid Continent only accept samples Monday – Friday. Coordination of sampling schedule will be arranged prior to deployment by field staff. DANR staff will only sample Monday – Thursday so that all samples are received by the lab Monday - Friday.

Lab staff will check temperature of samples once received in order to verify that they are within the holding standards. If the temperature limit of 6°C is exceeded, samples will have to be discarded and if possible, a re-sample may need to occur.

An SD DANR chain-of-custody form accompanies the samples, and includes the following for each sample:

- Waterbody/Location
- Site ID
- Date Sample Collected
- Time Sample Collected
- Sampler’s Initials

- Identification of QC Sample Type: Field Sample, Field Duplicate, Field Blank
- Analysis Required

The Chain of Custody Form will be signed and dated, relinquishing custody upon shipment to the laboratory. Example of the Chain-of-Custody form is attached in Appendix B.

Algae ID/enumeration samples will be stored at room temperature in the dark until samples are shipped to Aquatic Analysts for analysis. Samples will be shipped using standard postage. The Aquatic Analysts chain of custody form (shown in Appendix B) will accompany the samples.

B4: Analytical Methods

The analysis of chemistry and E. coli samples will be conducted by the SD Health Lab in Pierre, SD and Mid Continent Testing in Rapid City, SD. Chemistry samples will be analyzed for the parameters listed in Table 3. The SD Health Lab and Mid Continent Testing will follow all EPA approved methods for laboratory analysis. All DANR analytical methods for specific parameters can be found in the SD DANR WPP SOP Volume 1. The analysis of algae ID/enumeration samples will be conducted by Aquatic Analysts in Friday Harbor, WA.

All field staff will follow procedures outlined in the Statewide Lake Assessment Standard Operating Procedures Version 1 April 2022 for field sample and data collection.

B5: Quality Control

The SD Health Lab and Mid Continent are responsible for complying with their internal data quality requirements. If data quality requirements are not met, the specific laboratory will need to be in contact with project officer, Jesse Wilkens, in order to take necessary corrective actions. Data must be comparable for all samples within each sample set. Both the SD Health Lab and Mid Continent must follow in house QA/QC requirements. South Dakota DANR field staff and project partners will meet QA/QC guidelines and ensure that procedures including field duplicates, field blanks, field techniques, holding times, and forms are completed. On an annual basis, the project officer will evaluate blanks and duplicates of all samples and equipment to determine if acceptability requirements have been met. The South Dakota DANR field staff will follow their own QA/QC requirements of 20% (10% blanks and 10% replicates).

Field Duplicate:

The field duplicate samples will provide an indication of variability withing the sampling. Selection of sites for duplication is determined by field staff.

Field Techniques:

DANR field staff will ensure that all samples are collected using proper techniques and following SD DANR and EPA approved methodology.

Field Blank:

A field blank QA/QC sample is supplied to the SD Health Lab and Mid Continent for analysis for each sampling event (one per 10 samples). The blank sample should be treated like all other samples for the remainder of the field visit, during transportation and shipment.

Holding Times:

Holding times for sampled collected during SWLA are presented in the table below.

Table 6. Holding times and preservation methods for SWLA samples.

Bottle	Size & Material	Preservative	Parameters	Holding Time
A	1,000 mL HDPE or 250 mL HDPE	Cool to 6°C	Alkalinity, total solids, TSS, volatile solids, TDS, BOD, CBOD, CO ₃ , Hardness, K, lab pH, lab conductivity, nitrate, chloride, fluoride, HCO ₃ , SO ₄	48 hours
B	1,000 mL HDPE or 250 mL HDPE	2 mL H ₂ SO ₄ pH <2 Cool to 6°C	Ammonia, Nitrate+Nitrite, TKN, Total P, COD	28 days
C	100 mL or 250 mL sterilized HDPE	Na ₂ SO ₃ if chlorinated Cool to 6°C	Fecal coliform, <i>E. coli</i> , total coliform, enterococci, fecal PFG	24 hours
Chlorophyll-a	500, 1,000, or 2,000 mL brown HDPE bottle	Cool to 6°C	Chlorophyll-a	48 hours (unfiltered) 28 days (filtered)
Algae ID/enumeration	125 mL brown HDPE	Lugol's Solution	Algae ID/enumeration	1 year at room temperature

Chain of Custody Form:

Chain-of-Custody forms are used to handle and track samples from field collection to delivery to the laboratory. DANR staff will use the DANR Chain-of-Custody form show in Appendix B for all conventional samples sent to the SD Health Lab and Mid Continent. Algae ID/enumeration samples sent to Aquatic Analysis Inc. will use the Aquatic Analysts Inc. Chain-of-Custody form shown in Appendix C. Chain-of-Custody forms will be signed including the date and time when samples are shipped through an intermediary such as the SD Health Lab courier.

B6: Instrument/Equipment Testing, Inspection, and Maintenance

Multi-meter thermometers will be checked against an NIST verified thermometer by the WPP equipment manager, Jordan Turgeon, on an annual basis and will be replaced if not within 1 degree C of the NIST thermometer. Results of this testing are supplied to the WPP and DANR QA/QC officers. Sensors for pH will be replaced on an annual basis or as-needed. Sensors for dissolved oxygen and temperature/specific conductance will be checked annual and replaced on an as-needed basis when sensor calibration constants are not within manufacturer specifications. If a sensor does not perform to manufacturer specifications during the field season, it will be replaced as soon as possible. Field data will not be recorded by a sensor not meeting manufacturer specifications. Field staff may contact the SWLA project officer or the WPP equipment manager to obtain new sensors and parts for multi-meters.

B7: Instrument/Equipment Calibration and Frequency

Multi-meters will be calibrated for dissolved oxygen, pH, specific conductance, and depth every day before use. If a significant change in barometric pressure or altitude occurs, dissolved oxygen should be calibrated again. If the multi-meter does not calibrate because a sensor is out of range, that sensor may not be used for that day. If possible, the sensor should be replaced before proceeding with sampling.

B8: Inspection/Acceptance of Supplies and Consumables

The SD Health Lab will provide deionized water to Pierre WPP staff for the QA/QC blank samples that will be collected during the field season. Field offices will use distilled water purchases locally for blank samples. If blank samples result in detectable levels of analytes, a new blank sample will be collected using a different source of deionized or distilled water to account for possible contamination from the deionized or distilled water.

Oakton brand calibration buffer solutions for pH 7 and pH 10 will be purchased from Cole Parmer, Inc. and must not be expired before use. Calibration solution for specific conductance will be made by the SD Health Lab chemists and supplied to WPP staff. Specific conductance calibration solution must be used within 6 months of when a bottle is opened, according to SD Health Lab chemists.

B9: Non-direct Measurements

Annual results from previous SWLA sampling will be used to compare to the current year to look for any possible trends and to help build a long term dataset for the lakes in South Dakota.

B10: Data Management

Information management occurs on several levels. First, sample collection must be completed in a manner to ensure the quality, compatibility, and timeliness of the data collected. Once collected and organized, it must be available for review, analysis, and interpretation. Ultimately, the data may be used in several aspects: to assess water quality of the waterbody based on beneficial use and provide general information to other interested organizations and the public.

All data and results will ultimately be entered into the DANR NR92 water quality database. The SD Health Lab will transmit sample results and field notes from the Laboratory Information Management System to the NR92 database electronically. Mid Continent will provide the SWLA coordinator with sample results and field notes in MS Excel files monthly during field season that will be manually uploaded to the NR92 database.

Field notes for each site will be recorded on the DANR Chain-of-Custody form and include the following:

- Sampler(s) name(s)
- Station ID
- Date sample collected
- Time sample collected
- Additional observations

The SWLA coordinator will be responsible for ensuring all SWLA data is received from field staff and each lab and entered into the NR92 database. Once data is marked as approved by the SWLA coordinator it will be available for public access on the DANR Water Quality Monitoring Access Portal website:

<https://apps.sd.gov/NR92WQMAP>. Data may be downloaded directly from the NR92 database by DANR staff at any time.

C1: Assessment and Response Actions

The State of South Dakota is responsible for field sample collection and QA/QC procedures. Corrective actions for deficiencies will be addressed immediately in the field or will be resolved through collaboration of DANR staff.

The State of South Dakota will use the following assessments for SWLA:

Surveillance:

The project officer will keep in constant contact with the WPP field staff, the SD Health Lab and Mid Continent to ensure that all QA/QC components are being followed.

Peer Review:

Peer review may be performed before a project starts and after a project is completed. Staff members will review the SWLA project for completeness, accuracy, and proper documentation.

Field Performance Audit:

Field audits will be performed at the discretion of the SWLA project officer or the SD DANR WPP QA/QC officer. Field audits will typically be performed on an as-needed basis.

Systems Audit:

A full scale systematic, qualitative review of equipment, personnel, training, procedures, record keeping, data validation, data management and reporting aspects of the SD DANR WPP program will be completed by the SD DANR QAO, Tyler Frideres, every 5 years to evaluate SD DANR WPP QA/QC Procedures.

The EPA project manager or a representative of the Regional Quality Assurance Officer may, at any time, conduct an announced or unannounced audit or review of any data collection and analysis activities with assessment and implementation projects. This includes any contracts or subcontracts thereof used in the data collection and analysis effort.

C2: Reports to Management

On an annual basis the SD DANR WPP QAO, Tyler Frideres, will submit a quality assurance report to the SD DANR QAO, Shannon Minerich, who in turn reports the information to EPA and the Program Administrator in an annual report covering the SD SWLA Program. All reports will also be sent to the Team Leader and Administrative Leader. The report should include the following:

- Assessment results of measurement data, accuracy, precision, and completeness
- Results of performance and system audits
- Quality assurance issues
- List of training activities including dates
- Corrective actions and results
- A list of all QA documents, including status, and if the document is for a new or continuing project; (this would be a list of all SOPs, QAPPs, PIPs, SAPs and indicate if they are new, under revision, or approved)

D1: Data Review, Verification and Validation

The objective of data review is to assess whether the data collected achieved the quality objectives of the project. All analytical data generated for the Watershed Protection Program by a laboratory undergoes reduction and report preparation by the respective laboratory. Laboratory reports are reviewed by the project officer and the SD DANR WPP QAO for reasonableness. The field data recorded in the laboratory (date, time collected, depth, site number, etc.) are also checked against field reports for accuracy. Data review, verification, and validation are key steps in the transition from the assessment and TMDL phase to the implementation phase. Data review, verification, and validation are the responsibility of the Project Officer and are accomplished by following quality assurance guidelines and criteria addressed in the [SD DANR WPP-SOP, Volume I](#).

D2: Verification and Validation Methods

Data verification will include a review of the findings of all QA/QC assessment activities including:

- Appropriate sample collection and preparation of field transfer blank sample: assessed during sample collection by responsible field personnel.
- Chain-of-custody procedures: assessed by the responsible field personnel and laboratory sample custodians for the SD Health Lab, Mid Continent and Aquatic Analysts.
- Analytical data collection, recording, and reporting including laboratory QA/QC procedures: assessed by the SD Health Lab, Mid Continent and Aquatic Analysts.

Data review, verification and validation are key steps in the transition from the data collection to data review and acceptance. Data review, verification and validation are the responsibility of the project officer and are accomplished by following the quality assurance guidelines and criteria addressed in the SD DANR WPP-SOP, Volume 1.

D3: Reconciliation with User Requirements

It will be the State of South Dakota's responsibility to assess and interpret data originating from SWLA, but EPA assistance by the project manager is available upon request.

Appendix A: Lakes and Associated Stations for 2022 SWLA

Assessment Unit ID	Office/Staff	Tier	Lake Name	County	Stations
SD-BS-L-KAMPESKA_01	Pierre	1	Lake Kampeska	Codington County	SWLABAC9508, SWLAZZ29508, SWLAZZ29508A, SWLAZZ29508B, SWLAZZ29508C
SD-BS-L-PELICAN_01	Pierre	1	Pelican Lake	Codington County	SWLABAC9517, SWLAZZ29517, SWLAZZ29517A, SWLAZZ29517B, SWLAZZ29517C
SD-MN-L-COCHRANE_01	Pierre	1	Lake Cochrane	Deuel County	SWLABAC2305, SWLAZZ2305, SWLAZZ2305A, SWLAZZ2305B, SWLAZZ2305C
SD-BS-L-CLEAR_H_01	Pierre	2	Clear Lake (Hamlin)	Hamlin County	SWLABAC3202, SWLAZZ23202, SWLAZZ23202A, SWLAZZ23202B, SWLAZZ23202C
SD-BS-L-DRY_01	Pierre	2	Dry Lake	Codington County	SWLABAC9503, SWLAZZ29503, SWLAZZ29503A, SWLAZZ29503B, SWLAZZ29503C
SD-BS-L-DRY_NOZ_01	Pierre	2	Dry Lake Number 2	Clark County	SWLABAC1806, SWLAZZ1806, SWLAZZ1806A, SWLAZZ1806B, SWLAZZ1806C
SD-BS-L-GOOSE_01	Pierre	2	Goose Lake	Codington County	SWLABAC9504, SWLAZZ29504, SWLAZZ29504A, SWLAZZ29504B, SWLAZZ29504C
SD-BS-L-BITTER_01	Pierre	1	Bitter Lake	Day County	SWLABAC2205, SWLAZZ2205, SWLAZZ2205A, SWLAZZ2205B, SWLAZZ2205C
SD-BS-L-ENEMY_SWIM_01	Pierre	1	Enemy Swim Lake	Day County	SWLABAC2209, SWLAZZ2209, SWLAZZ2209A, SWLAZZ2209B, SWLAZZ2209C
SD-BS-L-PICKEREL_01	Pierre	1	Pickereel Lake	Day County	SWLABAC2219, SWLAZZ2219, SWLAZZ2219A, SWLAZZ2219B, SWLAZZ2219C
SD-BS-L-WAUBAY_01	Pierre	1	Waubay Lake	Day County	SWLABAC2226, SWLAZZ2226, SWLAZZ2226A, SWLAZZ2226B, SWLAZZ2226C
SD-JA-L-CLEAR_M_01	Pierre	1	Clear Lake	Marshall County	SWLABAC4807, SWLAZZ4807, SWLAZZ4807A, SWLAZZ4807B, SWLAZZ4807C
SD-MN-L-BIG_STONE_01	Pierre	1	Big Stone Lake	Roberts County	SWLABAC5502, SWLAZZ5502, SWLAZZ5502A, SWLAZZ5502B, SWLAZZ5502C
SD-RD-L-TRAVERSE_01	Pierre	1	Lake Traverse	Roberts County	SWLABAC5521, SWLAZZ5521, SWLAZZ5521A, SWLAZZ5521B, SWLAZZ5521C
SD-BS-L-BLUE_DOG_01	Pierre	2	Blue Dog Lake	Day County	SWLABAC2207, SWLAZZ2207, SWLAZZ2207A, SWLAZZ2207B, SWLAZZ2207C
SD-BS-L-BRANT_01	Sioux Falls	1	Brant Lake	Lake County	SWLABAC4302, SWLAZZ4302, SWLAZZ4302A, SWLAZZ4302B, SWLAZZ4302C
SD-BS-L-HERMAN_01	Sioux Falls	1	Lake Herman	Lake County	SWLABAC4306, SWLAZZ4306, SWLAZZ4306A, SWLAZZ4306B, SWLAZZ4306C
SD-BS-L-MADISON_01	Sioux Falls	1	Lake Madison	Lake County	SWLABAC4309, SWLAZZ4309, SWLAZZ4309A, SWLAZZ4309B, SWLAZZ4309C
SD-BS-L-ALVIN_01	Sioux Falls	1	Lake Alvin	Lincoln County	SWLABAC4401, SWLAZZ4401, SWLAZZ4401A, SWLAZZ4401B, SWLAZZ4401C
SD-BS-L-WALL_01	Sioux Falls	1	Wall Lake	Minnehaha County	SWLABAC9118, SWLAZZ9118, SWLAZZ9118A, SWLAZZ9118B, SWLAZZ9118C
SD-JA-L-MENNO_01	Vermillion/Pierre	2	Menno, Lake	Hutchinson County	SWLABAC3702, SWLAZZ3702, SWLAZZ3702A, SWLAZZ3702B, SWLAZZ3702C
SD-JA-L-HANSON_01	Vermillion/Pierre	2	Lake Hanson	Hanson County	SWLABAC3404, SWLAZZ3404, SWLAZZ3404A, SWLAZZ3404B, SWLAZZ3404C
SD-JA-L-HENRY_01	Vermillion/Pierre	2	Henry Reservoir	Near Scotland, SD	SWLABAC1205, SWLANEW1205, SWLANEW1205A, SWLANEW1205B, SWLANEW1205C
SD-MI-L-CORSICA_01	Vermillion/Pierre	2	Corsica Lake	Douglas County	SWLABAC2502, SWLAZZ2502, SWLAZZ2502A, SWLAZZ2502B, SWLAZZ2502C
SD-MI-L-DANTE_01	Vermillion/Pierre	2	Dante Lake	Charles Mix County	SWLABAC1703, SWLAZZ1703, SWLAZZ1703A, SWLAZZ1703B, SWLAZZ1703C
SD-JA-L-NORTH_SCATTERWOOD_01	Pierre	2	North Scatterwood Lake	Edmunds County	SWLABAC2608, SWLAZZ2608, SWLAZZ2608A, SWLAZZ2608B, SWLAZZ2608C
SD-JA-L-TWIN_02	Pierre	2	Twin Lakes	Spink County	SWLABAC5709, SWLAZZ5709, SWLAZZ5709A, SWLAZZ5709B, SWLAZZ5709C
SD-JA-L-WILLOW_CREEK_01	Pierre	2	Willow Creek Dam	Brown County	SWLABAC9314, SWLAZZ9314, SWLAZZ9314A, SWLAZZ9314B, SWLAZZ9314C
SD-JA-L-TWIN_01	Pierre	2	Twin Lakes	Sanborn County	SWLABAC5606, SWLAZZ5606, SWLAZZ5606A, SWLAZZ5606B, SWLAZZ5606C
SD-JA-L-WILMARTH_01	Pierre	2	Wilmarth Lake	Aurora County	SWLABAC1015, SWLAZZ1015, SWLAZZ1015A, SWLAZZ1015B, SWLAZZ1015C
SD-BA-L-MURDO_01	Pierre	2	Murdo Dam	Jones County	SWLABAC4102, SWLAZZ4102, SWLAZZ4102A, SWLAZZ4102B, SWLAZZ4102C
SD-MI-L-BURKE_01	Pierre	2	Burke Lake	Gregory County	SWLABAC3004, SWLAZZ3004, SWLAZZ3004A, SWLAZZ3004B, SWLAZZ3004C
SD-MI-L-ROOSEVELT_01	Pierre	2	Roosevelt Lake	Tripp County	SWLABAC6009, SWLAZZ6009, SWLAZZ6009A, SWLAZZ6009B, SWLAZZ6009C
SD-MI-L-EUREKA_01	Pierre	2	Eureka Lake	McPherson County	SWLABAC4703, SWLAZZ4703, SWLAZZ4703A, SWLAZZ4703B, SWLAZZ4703C
SD-MI-L-POCASSE_01	Pierre	2	Lake Pocasse	Campbell County	SWLABAC1608, SWLAZZ1608, SWLAZZ1608A, SWLAZZ1608B, SWLAZZ1608C

Appendix B: South Dakota DANR Water Quality Datasheet

Agency Code		SD DANR Water Quality Data				Rev 05/21
Sample Date	Time	Samplers Print/Sign				
Source Water				Station ID		
Site Location						
Project				Project ID		
Type of Sample	<input type="checkbox"/> Replicate	<input type="checkbox"/> Grab	<input type="checkbox"/> Integrated Vertical	Medium <input type="checkbox"/> Water / Other		
	<input type="checkbox"/> Blank	<input type="checkbox"/> Composite	<input type="checkbox"/> Integrated Flow	Relative Depth <input type="checkbox"/> Surface <input type="checkbox"/> Bottom <input type="checkbox"/> Midwater		

H2O Temp	C	Sample Depth	Ft	<i>Field Comments</i>
SPC	µmho/cm	Total Depth	Ft	
DO	mg/L	Width	Ft	
pH	SU	Gage Stage	Ft	
Secchi	Meters	Discharge	CFS	

All Samples must be packed in ice and chilled to 6 C

A - 1 Liter <input type="checkbox"/> Alkalinity <input type="checkbox"/> TSOL <input type="checkbox"/> TSSOL <input type="checkbox"/> VTSS <input type="checkbox"/> TDSOL <input type="checkbox"/> BOD <input type="checkbox"/> CBOD <input type="checkbox"/> CO3 <input type="checkbox"/> Hardness <input type="checkbox"/> K <input type="checkbox"/> Lab Cond <input type="checkbox"/> Cl <input type="checkbox"/> Fluoride <input type="checkbox"/> HCO3 <input type="checkbox"/> SO4	D - 100 mL Filtered + pH<2 0.25 mL H2SO4 <input type="checkbox"/> TDP <input type="checkbox"/> DIN	C - 100 mL Ixex <i>Na2SO3 if source is Chlorinated</i> Note: Use 250 mL bottle if requesting multiple tests <input type="checkbox"/> Fecal Coliform* <input type="checkbox"/> Total Coliform <input type="checkbox"/> Fecal PFGE <input type="checkbox"/> E Coli* <input type="checkbox"/> Enterococci*				Dissolved Metals - 250 mL Filtered + pH<2 ~1.5 mL HNO3 <input type="checkbox"/> Al <input type="checkbox"/> Sb <input type="checkbox"/> As <input type="checkbox"/> Ba <input type="checkbox"/> Be <input type="checkbox"/> B <input type="checkbox"/> Cd <input type="checkbox"/> Cr <input type="checkbox"/> Cu <input type="checkbox"/> Hg <input type="checkbox"/> Pb <input type="checkbox"/> Ni <input type="checkbox"/> Se <input type="checkbox"/> Ag <input type="checkbox"/> Ti <input type="checkbox"/> U <input type="checkbox"/> V <input type="checkbox"/> Zn <input type="checkbox"/> Mo <input type="checkbox"/> Silica	Recoverable Metals - 250 mL pH<2 ~1.5 mL HNO3 <input type="checkbox"/> Al <input type="checkbox"/> Sb <input type="checkbox"/> As <input type="checkbox"/> Ba <input type="checkbox"/> Be <input type="checkbox"/> B <input type="checkbox"/> Cd <input type="checkbox"/> Cr <input type="checkbox"/> Cu <input type="checkbox"/> Hg <input type="checkbox"/> Pb <input type="checkbox"/> Ni <input type="checkbox"/> Se <input type="checkbox"/> Ag <input type="checkbox"/> Ti <input type="checkbox"/> U <input type="checkbox"/> V <input type="checkbox"/> Zn <input type="checkbox"/> Mo
	R - 4L Cube <input type="checkbox"/> Ra 226 <input type="checkbox"/> Ra 228	V-40mL 3 - 40 mL Amber Vials 0.5 mL HCL Zero Head Space <input type="checkbox"/> TPH Gas	V1-40 mL 2 - 40 mL Amber Vials 0.5 mL HCL Zero Head Space <input type="checkbox"/> VOC	V2-120 mL 120 mL Amber Bottle 1.5 mL H2SO4 <input type="checkbox"/> TOC	V3-120 mL 120 mL Amber Bottle Filtered 1.5 mL H2SO4 <input type="checkbox"/> DOC		
	CN - 150 mL pH >10 ~0.4 mL NAOH <input type="checkbox"/> CN <input type="checkbox"/> WADCN	<i>Lab Comments</i>					
	H - Liter Glass Amber pH<2 ~2 mL HCL <input type="checkbox"/> TPH Diesel						
	OG - Liter Glass Amber pH<2 ~2 mL HCL <input type="checkbox"/> Oil Grease						
	Dissolved Metals - 100 mL Filtered + pH<2 ~0.5 mL HNO3 <input type="checkbox"/> Ca <input type="checkbox"/> Na <input type="checkbox"/> Mg <input type="checkbox"/> Mn <input type="checkbox"/> K <input type="checkbox"/> Fe						
	Recoverable Metals - 100 mL pH<2 ~0.5 mL HNO3 <input type="checkbox"/> Ca <input type="checkbox"/> Na <input type="checkbox"/> Mg <input type="checkbox"/> Mn <input type="checkbox"/> K <input type="checkbox"/> Fe						
	B - 1 Liter pH<2 ~2 mL H2SO4 <input type="checkbox"/> Ammonia <input type="checkbox"/> NO3+NO2-N <input type="checkbox"/> TKN <input type="checkbox"/> Total P <input type="checkbox"/> COD						
	E - 1 Liter <i>Filtered</i> <input type="checkbox"/> HCO3 <input type="checkbox"/> Cl <input type="checkbox"/> SO4 <input type="checkbox"/> Fluoride						
	Relinquished By: _____ Date/Time _____ Received By: _____ Date/Time _____ Relinquished By: _____ Date/Time _____ Received By: _____ Date/Time _____ Relinquished By: _____ Date/Time _____ Received By: _____ Date/Time _____						

Sample Temp (C)
Date / Time Received
Lab #

Appendix C: Chain of Custody Form for SWLA

Chain of Custody Form

Client:	Invoice to: (name, email)
Project:	PO #:
Contact: (name, email)	Shipping Date:

#	Lake/River	√	Date	Site	Depth (m / ft)	Ppk / Peri	Rush	Fast	Toxic Only	Het / Akin	Add'l counts	Comments
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												

Aquatic Analysts... 43 Telegraph Ln, Friday Harbor, WA 98250 (503) 869-5032 jwsweet@aol.com www.AAalgae.com